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ABSTRACT

The growing literature on semantic memory suggests that many concepts normally believed to belong to certain semantic categories functionally belong to other categories. This determination can be explored by a variety of priming methodologies in which a subject's reaction time is analyzed while making certain judgements about a visually presented word stimulus. To explore whether poor exemplars of natural categories are stored in the same memory location as are good exemplars, 100 native English-speaking subjects made lexical decision responses by pressing appropriate telegraph keys as they looked into a three-field tachistoscope. The results indicated that an automatic mechanism is involved in facilitating retrieval of good exemplars, and an attentional mechanism is involved in inhibiting retrieval of poor exemplars from semantic memory. (Author/JAC)

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Inhibition of Poor Exemplars in the Lexical Decision Task and Evidence of Automatic and Attentional Priming

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Abstract

The present study explores whether poor exemplars of natural categories are stored in the same memory locations as are good exemplars. The growing literature on semantic memory suggests that many concepts normally believed to belong to certain semantic categories, functionally belong to other categories. This determination can be explored by a variety of priming methodologies in which a subject's reaction time is analyzed when he makes certain judgements about a visually presented word stimulus. In this study a lexical decision paradigm was used to explore the category membership of various concepts and the information processing mechanisms involved in their retrieval from semantic memory. The results indicated that an automatic mechanism is involved in facilitating retrieval of good exemplars, and an attentional mechanism is involved in inhibiting retrieval of poor exemplars from semantic memory.

Introduction

In the lexical decision task the subject must rapidly indicate whether a visually presented string of letters forms a real word or a non-word. Lexical decision experiments are usually structured so that on any one trial, the subject cannot anticipate whether the upcoming letter string will be a real word or a non-word. The lexical decision is a very simple task because the subject is not required to make judgements about the meaning of the word. The lexical decision task can be used to explore relations among concepts in semantic memory. This can be done because the lexical decision task is sensitive to semantic context variables. A subject's reaction time to a given word can be reduced by 40-60 msec if he is first shown a word that is semantically related to the word to which he is to respond. This procedure is called priming. For example, it takes a subject 550 msec to decide that the word peach is a real word; another subject primed with the word fruit will take 50 msec less to respond to the same word. Presenting the word fruit makes the word peach more accessible to the subject for the purpose of making a response.

The mechanism by which priming has been generally thought to occur is in terms of semantic bias. Meyer and Schvaneveldt (1971), who pioneered some of the lexical decision research, adapted Morton's (1970) logogen model in order to explain priming effects. They assume that an array of word detectors exists in lexical memory which responds to the semantic features of a word stimulus. Each detector maintains a count of the stimulus

characteristics which match the characteristics of the word represented by the detector. Once a criterion number of features has been counted by a given word detector, the detector is activated above a threshold, and the word is recognized. The effect of a semantically related prime word is to raise the initial feature count in semantically related word detectors above their normal resting level. Thus, fewer stimulus features are needed for the recognition of a semantically primed word, than for an umprimed word. Since the feature extraction process presumably operates in real time, it is possible to characterize priming effects in terms of shorter reaction times.

The literature on priming is not clear about the extent to which a prime spreads activation to all semantically related logogens. Specifically, Rosch (1975) found that category-word primes differentially affected the recognition speed of good and poor exemplars of a category, in that only good exemplars were facilitated and poor exemplars were inhibited. Rosch reported this effect as the major finding of her study on structure of natural categories, and argued that poor exemplars were inhibited by category primes because they belong functionally to other categories than those to which they belong technically. Rosch used a same-different task, but her study is often cited in the lexical decision literature because the two tasks are somewhat related. In a same-different task, the subject is shown a prime and must then decide whether two simultaneously presented targets are physically identical.

Rosch's findings were challenged by Neely (1977). Using a lexical decision task, he found that priming subjects with category names facilitated the processing of both good and poor exemplars. This is an important challenge to Rosch's findings because whether poor exemplars are facilitated or inhibited by their category name bears on how we think concepts are organized in semantic memory. It is important to know whether, like unrelated concepts, the semantic distance between category names and poor exemplars is beyond that which activation can spread.

The purpose of the present experiment was to use a lexical decision task to explore whether category primes affect the recognition of good and poor exemplars differently and whether this is attributable to spread of activation or other mechanisms. Posner and Snyder (1975) have described a two-process theory of retrieval from long term memory that they used to explain priming phenomena. One of these processes is a fast acting spread of activation mechanism that occurs automatically. The other process is a limited-capacity attentional mechanism that is slow acting and inhibits the read-out of information stored in semantically unrelated logogens.

Because the attentional mechanism is slow acting in affecting logogens on which it has been focused, it will inhibit the access of unrelated target words if they are presented too soon after the prime is presented. A prime-to-target interval of at least 400 msec is required to allow the subject to focus his attention upon the logogen that corresponds to the prime.

Posner and Snyder tested their two-process theory of priming with a special methodology. Since then, many investigators, including Neely and Rosch, have used variations of their method to explore different automatic and attentional effects. The present experiment employed their methodology as follows:

Method

One hundred native English speaking subjects were instructed to make lexical decision responses by pressing appropriate telegraph keys as they looked into a 3-field tachistoscope. They were told that on some trials they would not be given a priming word prior to the letter string, but that instead they would see a row of three X's. The X's were intended to serve as neutral primes. They also served to present, to half of the subjects, the same targets unprimed, that the other half of the subjects received with primes, thereby producing controls for evaluating priming effects. All subjects received 50 practice trials which stimuli comparable to those used in the experimental session. The stimuli of interest presented during the session consisted of 20 category names that served as primes for 10 good and 10 poor exemplars. Good exemplars were ranked third or fourth best examplars of their category according to the Battig and Montague (1969) norms of category membership. Exemplars rated first or second were not used to minimize the strength of association that might exist between them and their respective category names. The ten poor exemplars were ranked no higher than 25th in their category and had a mean frequency of occurrence according to the Kucera and Francis (1967) count of 35 per million as did the good exemplars.

Note that Neely (1977) reported that the poor exemplars in his study had lower frequencies of occurrence than those of the good exemplars. Becker (1979) has shown that semantic priming aids the processing of low frequency words more than that of high frequency words. This could have accounted for Neely's facilitation effect with of poor exemplars.

To continue, supplementary primes and targets were also presented so that on 75% of the trials when word primes and targets were presented, the primes would help the subjects anticipate the targets. Word primes given with poor exemplars were not supposed to help the subjects, and these comprised 25% of the trials when word primes and targets were presented. The strategy was to make the subjects expect that the primes were usually good predictors of the targets and then unexpectedly present primes that were not good predictors of the targets. This procedure was intended to misdirect the attention of the subjects and cause them to take longer to respond to the targets than if no prime was presented.

According to Posner and Snyder (1975) it takes at least 400 msec to focus attention on a prime. The subjects in the present study either received targets 300 or 900 msec after the prime. The 300 msec group would not have time to focus their attention on the prime before having to respond to the target and were not expected to show inhibition with poor exemplars. The 900 msec group would have time to attend to the prime and were expected to show inhibition with poor exemplars.

Results and Discussion

In order to assess directly the effects of the category primes, difference scores were calculated from the raw reaction times. For each subject, a mean was obtained for the primed words and the corresponding unprimed words in each list half of items within each exemplar condition. The means for the primed and unprimed words were subtracted from each other for each subject. A 3 factor analysis of variance was conducted on the difference score in which prime-to-target interval and target-list half were treated as between-subjects variables, and the goodness-of-exemplar variable was treated as a within-subjects variable. The Tukey method for pairwise comparison required that a 31 msec difference be achieved for significance.

Table 1 shows the significant priming effects obtained for each of the four experimental conditions. There was a

Table 1

Net facilitation and inhibition (-) of good and poor exemplar targets primed with category names.

	Prime to Target Interval	
	300	900
Target		
Good Exemplar	48	55
Poor Exemplar	-11	-52

Note: ± 31 msec required for significance at the .05 level.

facilitating effect for good exemplars when the prime occurred 300 and 900 msec before the target. Thus category names facilitated the processing of the good-exemplars after 300 msec because the fast acting automatic mechanism spread activation to all logogens semantically related to the prime immediately after the prime was presented. In the 900 msec condition, sufficient time was allowed for attention to be focused on the prime and related logogens, but because the good exemplars had been activated fully by the automatic process, no further activation was needed to initiate a response.

The category primes did not facilitate the recognition of the poor exemplars when presented 300 msec after the prime, because the automatic process spread activation only to the logogens semantically related to the category primes (not to the logogens of the poor exemplars). Their processing was not inhibited by the attentional process, because insufficient time was allowed for it to be focused on the prime. In the 900 msec condition, category primes inhibited the recognition of the poor exemplars for two reasons. First, because the automatic process did not spread activation to their logogens, and second, because attention had time to be focused on the prime which was not near the location where the poor exemplars were represented. Therefore it was necessary for the subject to shift his attention to the logogen of the target presented to make a correct response. Shifting attention took extra time which was reflected in an inhibition effect.

Therefore, the present results are in accord with Rosch's major conclusion that poor exemplars of natural categories do not belong to the categories that we normally think they do.

References

Battig, W. R., & Montague, W. E. Category norms for verbal items in 56 categories: A replication and extension of the Connecticut category norms. Journal of Experimental Psychology Monograph, 1969, 80 (3, Pt. 2).

Becker, C. A. Semantic context and word frequency effects in visual-word recognition. Journal of Experimental Psychology: Human Perception and Performance, 1979, 5, 252-259.

Kucera, H., & Francis, W. N. Computational analysis of present day American English. Providence: Brown University Press, 1967.

Meyer, D. E., & Schvaneveldt, R. W. Facilitation in recognizing pairs of words: Evidence of a dependence between retrieval operations. Journal of Experimental Psychology, 1971, 90, 227-234.

Morton, J. A functional model of memory. In D. A. Norman (Ed.), Models of human memory. New York: Academic Press, 1970.

Posner, M. I., & Snyder, C. R. Attention and cognitive control. In R. L. Solso (Ed.), Information processing and cognition: The Loyola symposium. Hillsdale, N. J.: Erlbaum, 1975.

Rosch, E. Cognitive representations of semantic categories. Journal of Experimental Psychology: General, 1975, 104, 192-233.